MONTANA FISH, WILDLIFE AND PARKS
FISHERIES DIVISION

Draft Environmental Assessment of the Rotenone Treatment of Ostle Reservoir for the Removal of an Expanding White Sucker Population and Restocking with Rainbow Trout.

PART I: PROPOSED ACTION DESCRIPTION

A. Type of Proposed Action: Montana Fish, Wildlife & Parks (MFWP) proposes the use of piscicides (rotenone) to eliminate white suckers from Ostle Reservoir. After white suckers are successfully removed, rainbow trout (RB) would be stocked into the reservoir.

B. Agency Authority for the Proposed Action:

87-1-702. Powers of department relating to fish restoration and management. The department is hereby authorized to perform such acts as may be necessary to the establishment and conduct of fish restoration and management projects as defined and authorized by the act of congress, provided every project initiated under the provisions of the act shall be under the supervision of the department, and no laws or rules or regulations shall be passed, made, or established relating to said fish restoration and management projects except they be in conformity with the laws of the state of Montana or rules promulgated by the department, and the title to all lands acquired or projects created from lands purchased or acquired by deed or gift shall vest in, be, there remain in the state of Montana and shall be operated and maintained by it in accordance with the laws of the state of Montana. The department shall have no power to accept benefits unless the fish restoration and management projects created or established shall wholly and permanently belong to the state of Montana, except as hereinafter provided.

C. Estimated Commencement Date: August, 2013.

D. Name and Location of the Project**:** Rotenone treatment of Ostle Reservoir for the removal of an expanding white sucker population and restocking with rainbow trout to improve the quality of Ostle Reservoir's fishery.

Ostle Reservoir is located in Teton County on the Rocky Mountain Front in the Teton River drainage approximately 26 miles northwest of Choteau, Montana; T26N R8W S34 (Figure 1). The dam is located at approximately 47.97101°N, -112.63146°W. It is an irrigation reservoir that receives surface runoff and inflow from Rinker Creek and an unnamed ditch conveying water from the Blackleaf Fen and Muddy Creek. The reservoir is located entirely on the Blackleaf Wildlife Management Area (WMA), public land owned and administered by Montana Fish, Wildlife & Parks.

E. Project Size (acres affected)
1. Developed/residential – 0 acres
2. Industrial – 0 acres
3. Open space/Woodlands/Recreation – 0 acres

4. Wetlands/Riparian – At full pool, Ostle Reservoir is 37 surface acres, has a maximum depth of 10 feet and maximum volume of approximately 100 acre-feet. The reservoir would be treated at dead storage elevation (Figure 2). Rinker Creek enters the reservoir on the southwest shore. It is an ephemeral drainage that would not have surface flow at time of project implementation. An unnamed perennial ditch that drains from the Blackleaf Fen enters Ostle Reservoir from the north. The extent of this small ditch conveying surface water (<0.5 miles) would also be treated with rotenone.
5. Floodplain – 0 acres
6. Irrigated Cropland – 0 acres
7. Dry Cropland – 0 acres
8. Forestry – 0 acres
9. Rangeland – 0 acres

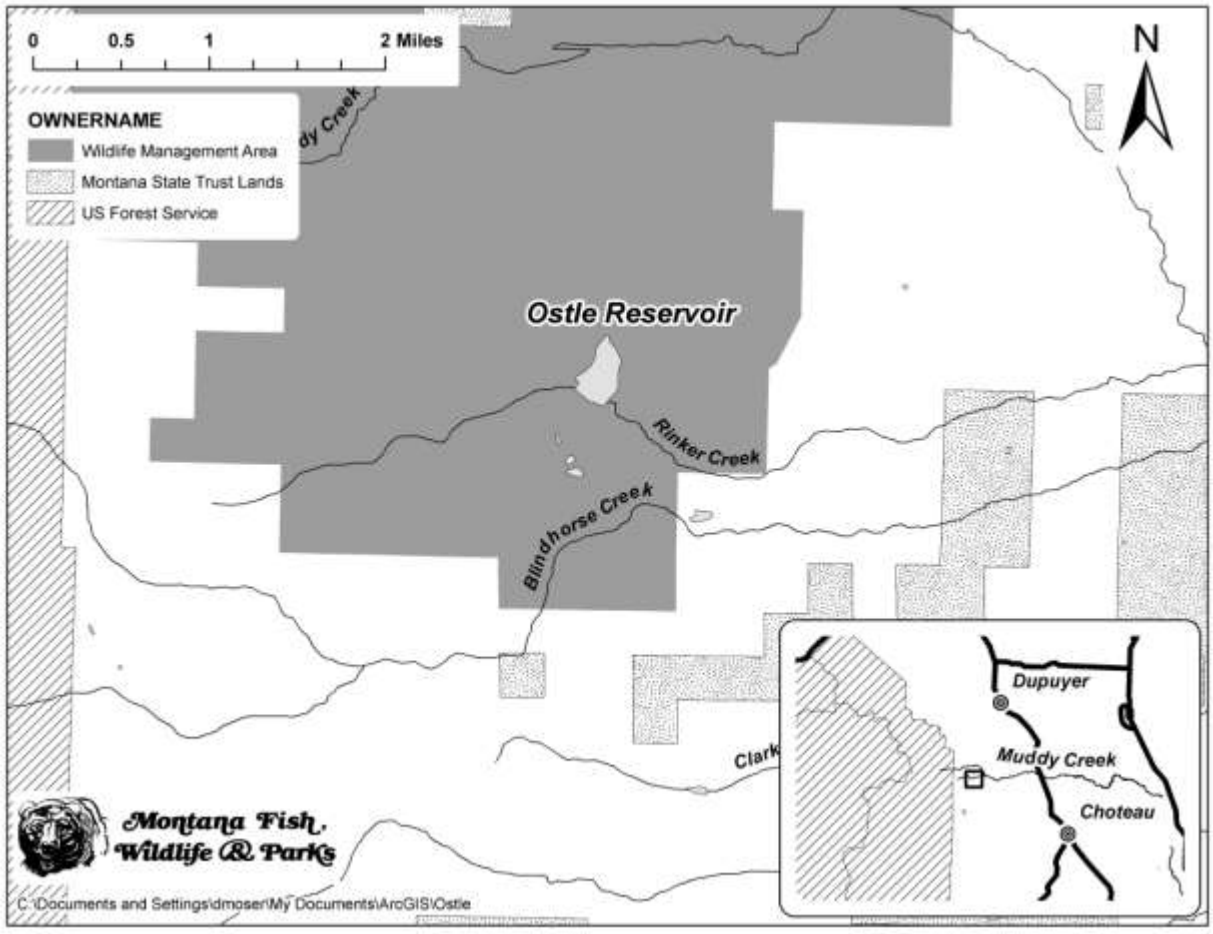

Figure 1. Area map of the proposed project site.

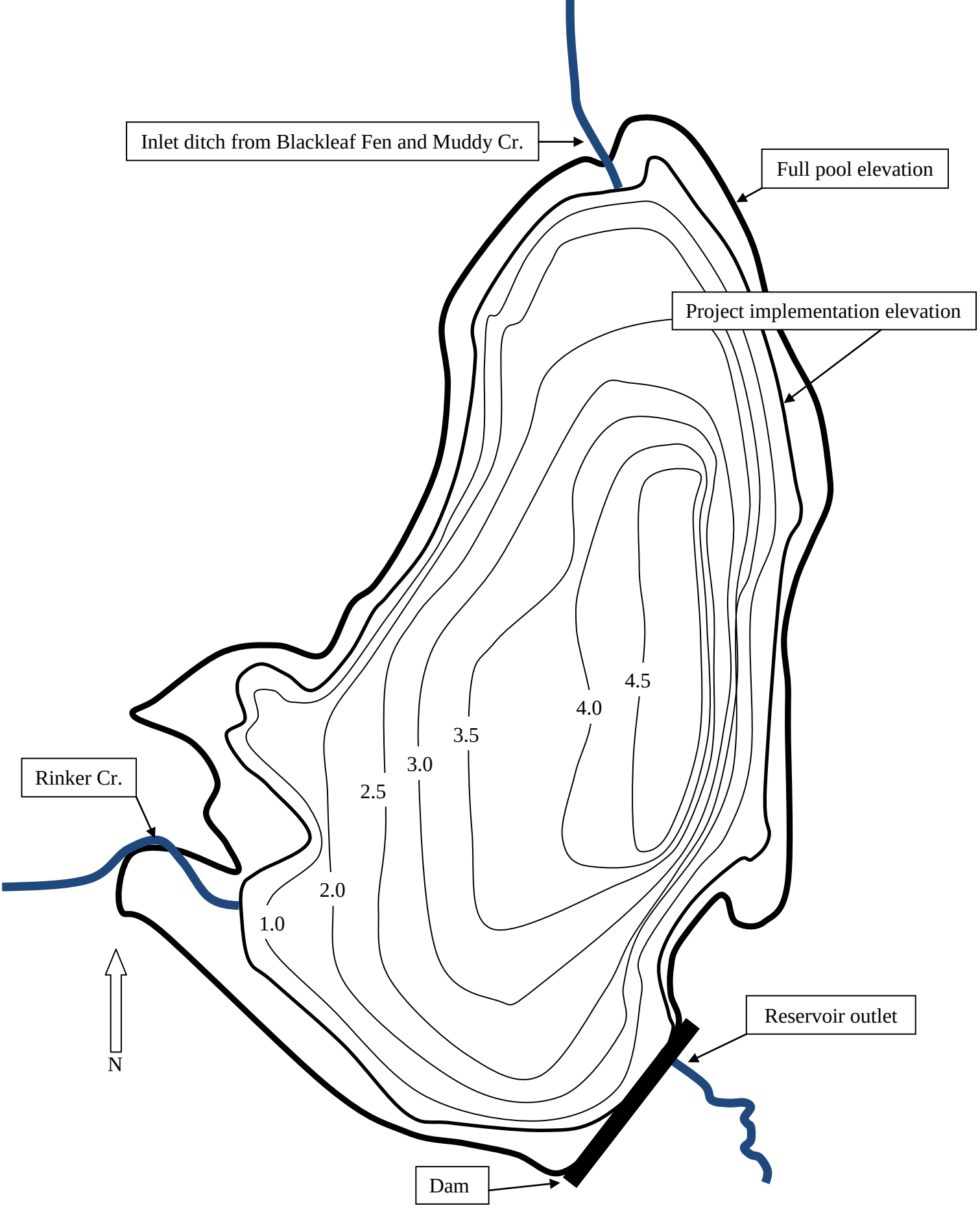

Figure 2. Bathymetric map of Ostle Reservoir. The reservoir at dead storage elevation has a surface area of 27 acres and volume of 64 ac-ft.

F. Narrative Summary of the Proposed Action and Purpose of the Proposed Action

Ostle Reservoir has a history of providing quality angling for trout. MFWP purchased the private land containing Ostle Reservoir in 1967 and created the Blackleaf Wildlife Management Area (WMA). Previous owners stocked the reservoir with eastern brook trout which grew up to several pounds. MFWP first stocked the reservoir in 1967 with 5,400 rainbow trout, although the reservoir winterkilled the following year. Since 1983, approximately 2,000 rainbow trout have been stocked annually during good water years. In 2001, construction work was completed to alleviate structural deficiencies with the outlet structure, spillway and dam embankment. MFWP fishing pressure estimates indicated 65 five angler days of use in 1993, while 46 angler days were estimated in 2009. Rainbow trout up to 18 inches in length have been sampled during MFWP netting surveys. Netting results from 2009 were dominated by a population of stunted white suckers (mean total length 10.5 inches) which comprised 90 percent of the net catch. Surveys also found fathead and brassy minnows present in Ostle Reservoir.

The proposed action is to remove all the fish in Ostle Reservoir using the piscicides Prenfish (5% liquid rotenone) and/or Prentox (7% powder rotenone). Upon project completion, the reservoir would be restocked with hatchery-produced rainbow trout. Fathead and brassy minnows may also be re-introduced into Ostle Reservoir. The removal of white suckers would result in improved growth and condition of rainbow trout stocked into Ostle Reservoir.

MFWP has a long history of using rotenone to manage fish populations in Montana that span as far back as 1948. The department has administered rotenone projects for a variety of reasons, but principally to improve angling quality or for native fish conservation.

Rotenone is a naturally occurring substance derived from the roots of tropical plants in the bean family such as the jewel vine (*Derris* spp.) and lacepod (*Lonchocarpus* spp.) that are found in Australia, Oceania, southern Asia, and South America. Rotenone has been used by native people for centuries to capture fish for food in areas where these plants are naturally found. It has been used in fisheries management in North America since the 1930s. Rotenone has also been used as a natural insecticide for gardening and to control parasites such as lice on domestic livestock (Ling 2002). Rotenone acts by inhibiting oxygen transfer at the cellular level. It is especially effective at low concentrations with fish because it is readily absorbed into the bloodstream through the thin cell layer of the gills. Mammals, birds and other non-gill breathing organisms do not have this rapid absorption route into the bloodstream, and thus can tolerate exposure to concentrations much higher than that used to kill fish.

The boundaries for this treatment would span from Ostle Reservoir to the upper extent of the small stream draining the Blackleaf Fen, a distance of approximately 0.5 miles. This tributary stream/ditch would be treated with Prenfish *(5% liquid rotenone).* The reservoir would be treated with a combination of Prenfish (5% liquid rotenone) and Prentox (7% powdered rotenone), as would any residual pools remaining in Rinker Creek. Although surveys have not detected any springs in the reservoir, a small amount of powdered rotenone Prentox (7% powdered rotenone) may be used to treat any spring refugia identified during the application. We would follow established label recommendations for application concentrations when treating the reservoir and connecting waters. On-site assays using caged fish would determine

the appropriate concentrations needed, which is estimated to be near 1 mg of Prenfish per 1 liter of water to remove white suckers. Treatment of Ostle Reservoir would occur after irrigation season when the outlet structure is closed and the water level is below the outlet elevation.

MFWP has discussed this project with the local landowner that irrigates out of Ostle Reservoir and he has agreed to have it drawn down to dead storage by mid August. At dead storage, Ostle Reservoir has a volume of 64 acre-feet, calculated using the Triangulate Integrated Network Method (A. Peterson, MFWP, personal communication). To achieve the objectives of the treatment, we would use approximately 21.3 gallons of Prenfish to attain a targeted concentration of 1 mg/L. Applied Prenfish would persist in the lake for approximately three to five weeks depending on the amount of fresh water entering the lake from the feeder ditch, water temperature, sunlight intensity, and alkalinity.

A small boat and outboard motor fitted with a pump and diffuser would be used to dispense the rotenone in the reservoir. The concentration of rotenone to be used in treating Ostle Reservoir would be calculated using product label application specifications. We would apply rotenone to the marshy areas around the reservoir and to any backwaters on the tributary ditch with backpack sprayers. A mixture of powdered rotenone (Prentox 7% rotenone), sand, and gelatin may be applied on a limited basis. A powdered rotenone mix would only be used in springs and seeps that have potential to provide refugia for the target fish. The materials and equipment would be transported to the site by a truck.

Rinker Creek would not have surface flow at the time of treatment. All remaining residual pools in the creek would be sprayed with rotenone applied from a backpack sprayer. The small tributary ditch entering Ostle Reservoir from the Blackleaf Fen would be treated with two drip stations, one at the upper extent of surface flow and the other near the ditch's mouth to prevent fresh water from diluting the reservoir water. Drips stations dispense a pre-determined amount of liquid rotenone at a constant rate for a specific period of time. The tributary ditch would be treated for approximately eight hours.

There are three ways in which rotenone can be detoxified: natural oxidation, dilution by freshwater and introduction of a neutralizing agent such as potassium permanganate. We would rely on both freshwater dilution from the tributary ditch and natural oxidation to neutralize the rotenone treatment in Ostle Reservoir (see section 2a).

White suckers would be held in holding cages during the treatment to evaluate the effectiveness of the rotenone application in completing the project's objectives. Two to three weeks after the project is completed, we would hold live rainbow trout in cages in four different areas to determine if the reservoir has naturally detoxified and is suitable for stocking. The rotenone label specifies that once caged fish survive 24 hours in treated lake water, it is considered detoxified and is safe for restocking.

Trap net and/or gill net sampling would be completed once Ostle Reservoir detoxifies to determine the effectiveness of the rotenone treatment. If any live white suckers are sampled, a second treatment would be required to achieve the desired objectives of this project. If project objectives were not met with the first treatment, a second treatment would be conducted as soon

as possible. In the event that a second treatment is delayed until the following year, a supplemental analysis to this EA would be prepared.

Monitoring is an important component of this type of management activity (Meronek et al. 1996). By way of example, MFWP conducted extensive monitoring of the 2005 rotenone treatment of Martin Creek and Martin Lakes near Olney. The results indicated the stream naturally detoxified with dilution from freshwater within 48 hours. This treatment was contained within the specified boundaries by detoxification with potassium permanganate and dilution by freshwater. Martin Lakes were treated with 1.17 ppm Prenfish rotenone. Although very little freshwater was flowing into the lakes, the water was no longer toxic to fish after 44 days (Schnee 2006). Plankton blooms occurred in Martin lakes 160 days after the treatment. Columbia spotted frogs were observed depositing eggs in Martin Lakes the following spring. In 2006, Blue Lake near Stryker was treated with 1.5 ppm Prenfish rotenone and the lake naturally detoxified in 77 days (Schnee 2007a). MFWP has extensive experience conducting this type of monitoring, and we would employ a similar strategy on Ostle Reservoir.

The lake would be restocked with hatchery rainbow trout either in fall 2013 or spring 2014 if the first treatment is successful. If a second treatment is required, stocking may be delayed an additional year. Approximately 2,000 rainbow trout would be stocked from the Montana state hatchery system.

PART II. ENVIRONMENTAL REVIEW

A. PHYSICAL ENVIRONMENT

1. LAND RESOURCES **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Soil instability or changes in geologic substructure?		X				
b. Disruption, displacement, erosion, compaction, moisture loss, or over-covering of soil which would reduce productivity or fertility?		X				
c. Destruction, covering or modification of any unique geologic or physical features?		X				
d. Changes in siltation, deposition or erosion patterns that may modify the channel of a river or stream or the bed or shore of a lake?		X				
e. Exposure of people or property to earthquakes, landslides, ground failure, or other natural hazard?		X				

2. WATER Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Discharge into surface water or any alteration of surface water quality including but not limited to temperature, dissolved oxygen or turbidity?			X		Yes	2a
b. Changes in drainage patterns or the rate and amount of surface runoff?		X				
c. Alteration of the course or magnitude of flood water or other flows?		X				
d. Changes in the amount of surface water in any water body or creation of a new water body?		X				
e. Exposure of people or property to water related hazards such as flooding?		X				
f. Changes in the quality of groundwater?		X				2f
g. Changes in the quantity of groundwater?		X				
h. Increase in risk of contamination of surface or groundwater?			X		Yes	see 2a, 2f
i. Effects on any existing water right or reservation?		X				
j. Effects on other water users as a result of any alteration in surface or groundwater quality?		X				2j
k. Effects on other users as a result of any alteration in surface or groundwater quantity?		X				
l. Will the project affect a designated floodplain?		X				
m. Will the project result in any discharge that will affect federal or state water quality regulations? (Also see 2a)			X		Yes	2m

Comment 2a: The proposed project is designed to intentionally introduce a pesticide to surface water to remove unwanted fish. The impacts would be short term and minor. Prenfish (5% Liquid) and Prentox (7% powder) rotenone are EPA registered pesticides and are safe to use for removal of unwanted fish. The proposed concentration of Prenfish (5% Liquid) and Prentox (7% powder) is 1 part per million, but could be adjusted within the label allowed limits based upon the results of on-site assays. Prentox (7% powder) may be used in a sand and gelatin mix to treat springs and seeps within the treatment area.

There are three ways in which rotenone can be detoxified once applied. The most common method is to allow natural breakdown to occur. Rotenone is a compound that is susceptible to natural breakdown (detoxification) through a variety of mechanisms such as water chemistry, water temperature, exposure to organic substances, exposure to air, and sunlight intensity (Ware 2002; ODFW 2002; Loeb and Engstrom-Heg 1970; Engstrom-Heg 1972; Gilderhus et al. 1986). Ostle Reservoir's shallow profile may promote detoxification of rotenone. Rotenone persistence studies by Gilderhus et al. (1986) and Dawson et al. (1991) found that in cool water temperatures of 32 to 46 F, the half-life ranged from 3.5 to 5.2 days. Gilderhus et al. (1986) reported that 30% mortality was experienced in rainbow trout exposed to degrading concentrations of actual rotenone (0.004 ppm) in 46 F pond water 14 days after a treatment. By day 18 the concentrations were sub-lethal to trout. The second method for detoxification involves basic dilution by fresh water. This may be accomplished by fresh ground water or surface water flowing into a lake or stream. The final method of detoxification involves the application of an oxidizing agent like potassium permanganate. This dry crystalline substance is mixed with stream or lake water to produce a concentration of liquid sufficient to detoxify the rotenone. Detoxification is accomplished after about 15-30 minutes of exposure time between the two compounds (Prentiss Inc. 1998, 2007). This project would only be conducted when water levels are below the outlet structure so we would rely on freshwater dilution and natural breakdown to detoxify the stream and reservoir water. Based on similar rotenone treatments in Montana, it is predicted the stream would detoxify within 48 hours after the drip stations are removed, and the reservoir should detoxify within three to five weeks post-treatment.

Dead fish would result from this project. Bradbury (1986) reported that approximately 70% of rotenone fish killed in Washington lakes never surfaced. Although no trout were involved with his study, Parker (1970) reported that in water temperatures of 40 F and less, dead fish required 20-41 days to surface. The most important factors inhibiting fish from ever surfacing are cooler water (<50 F) and deep water (>15 feet). Dead fish that surface would be collected and disposed of properly. Bradbury (1986) reported that 9 of 11 water bodies in Washington treated with rotenone experienced an algae bloom shortly after treatment. This is attributed to the input of phosphorus to the water as a result of decaying fish. Bradbury further notes that approximately 70% of the phosphorus content of the fish stock would be released into the lake through bacterial decay. This action stimulates phytoplankton production, then zooplankton production, and thus initiates the production of food for fish. This change in water chemistry is viewed as a benefit to stimulate plankton growth. Any changes or impacts to water quality resulting from decaying fish would be short term and minor.

Comment 2f: There are no wells located near Ostle Reservoir. No contamination of groundwater is anticipated to result from this project. Rotenone binds readily to sediments, and is broken down by soil and in water (Skaar 2001; Engstrom-Heg 1971, 1976; Ware 2002). Rotenone moves only one inch in most soil types; the only exception is sandy soils where movement is about three inches (Hisata 2002). In California, studies where wells were placed in aquifers adjacent to and downstream of rotenone applications have never detected rotenone, rotenolone, or any of the other organic compounds in the formulated products (CDFG 1994). Case studies in Montana have concluded that rotenone movement through groundwater does not occur. For example, at Tetrault Lake, Montana neither rotenone nor inert ingredients were

detected in a nearby domestic well, which was sampled two and four weeks after applying 90 ppb rotenone to the lake. This well was chosen because it was down gradient from the lake and also drew water from the same aquifer that fed and drained the lake. In 1998, a Kalispell-area pond was treated with Prenfish 5% rotenone. Water from a well, located 65 feet from the pond, was analyzed and no sign of rotenone was detected. In 2001, another Kalispell-area pond was treated with Prenfish 5% rotenone. Water from a well located 200 feet from that pond was tested four times over a 21 day period and showed no sign of contamination. In 2005, MFWP treated a small pond near Thompson Falls with Prenfish to remove pumpkinseeds and bass. A well located 30 yards from the pond was tested and neither Prenfish nor inert ingredients were found in the well.

Because ground water leaving Ostle Reservoir must travel through lake sediments, soil, and gravel, and rotenone is known to bind readily with these substances, we do not anticipate any contamination of ground water.

Inert ingredients in Prenfish volatilize rapidly in the environment by both photolysis and hydrolysis and therefore do not pose a threat to the environment at the levels proposed for fish eradication.

Comment 2j: The Prenfish label states "….Do not use water treated with rotenone to irrigate crops or release within 1/2 mile upstream of a potable water or irrigation water intake in a standing body of water such as a lake, pond or reservoir…"

The proposed treatment of Ostle Reservoir would occur in mid-August when the reservoir would be drawn down to dead storage and the outlet structure would be closed. The reservoir would not provide irrigation water or meet any other agricultural or domestic water needs for the remainder of 2013. The reservoir water would naturally detoxify by the start of the irrigation season in spring 2014.

Comment 2m: MFWP would apply rotenone under the Montana Dept. of Environmental Quality (DEQ) General Permit for Pesticide Application (#MTG87000). A Notice of Intent was accepted by the Department of Environmental Quality. The NOI included the waters proposed in this EA. A letter was received from DEQ dated August 13, 2012 recognizing the Notice of Intent and allowing MFWP to operate under the General permit for Pesticide Application.

Cumulative Impacts: The proposed action of piscicide treatment would have a short-term impact on water quality and potentially a longer-term impact on species community composition (not abundance) of primary and secondary producers in Ostle Reservoir. These impacts would attenuate through time and would not negatively impact the productivity of fisheries resources after restocking. We do not expect the proposed action to result in other actions that would create cumulative impacts to water resources in Ostle Reservoir. Nor do we foresee any other activities in the basin that would add to impacts of the proposed action. As such there are no cumulative impacts to land resources related to treatment of Ostle Reservoir with piscicides.

3. AIR Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Emission of air pollutants or deterioration of ambient air quality? (also see 13 (c))			X			3a
b. Creation of objectionable odors?			X		Yes	3b
c. Alteration of air movement, moisture, or temperature patterns or any change in climate, either locally or regionally?		X				
d. Adverse effects on vegetation, including crops, due to increased emissions of pollutants?		X				
e. Will the project result in any discharge which will conflict with federal or state air quality regs?		X				

Comment 3a: Emissions from outboard motors would be created, but are expected to dissipate rapidly. Any impacts from these odors would be short term and minor.

Comment 3b: Prenfish liquid formulated rotenone does contain aromatic solvents that make it soluble in water. This smell of these solvents, primarily naphthalene, may last for several hours to several days, depending on air and water temperatures and wind direction. These relatively heavy organic compounds tend to sink (remain close to the ground) and move downwind. The California Department of Pesticide Regulation (CDPR 1998, cited in Finlayson et al. 2000) found no health effects from this smell. Applicators would have the greatest contact with these odors, but would be protected because they would be wearing respirators as the product label recommends. Any impacts caused by objectionable odors would be short term and minor.

Dead fish would result from this project and may cause objectionable odors. This would be mitigated by collecting and/or sinking dead fish in Ostle Reservoir. We would expect odors from dead fish to be short term and minor.

4. VEGETATION Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Changes in the diversity, productivity or abundance of plant species (including trees, shrubs, grass, crops, and aquatic plants)?			X			4a
b. Alteration of a plant community?		X				
c. Adverse effects on any unique, rare,		X				

threatened, or endangered species?						
d. Reduction in acreage or productivity of any agricultural land?		X				
e. Establishment or spread of noxious weeds?		X				
f. Will the project affect wetlands, or prime and unique farmland?		X				

Comment 4a: Ostle Reservoir is located on the Rocky Mountains-Plains interface. The fishing access site at the reservoir has a large parking area to stage the operation. There would be minimal trampling of vegetation around the reservoir while completing the project. There would be some trampling of vegetation along the tributary stream while backpack spraying and the placement and monitoring of drip stations and sentinel fish locations. Rotenone does not have an effect on plants when used at concentrations sufficient to kill fish. Impacts from trampling vegetation are expected to be short term and minor.

5. FISH/WILDLIFE **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Deterioration of critical fish or wildlife habitat?		X				
b. Changes in the diversity or abundance of game animals or bird species?			X		Yes	5b
c. Changes in the diversity or abundance of nongame species?			X		Yes	5c
d. Introduction of new species into an area?		X				
e. Creation of a barrier to the migration or movement of animals?		X				
f. Adverse effects on any unique, rare, threatened, or endangered species?			X		Yes	5f
g. Increase in conditions that stress wildlife populations or limit abundance (including harassment, legal or illegal harvest or other human activity)?		X				
h. Will the project be performed in any area in which T&E species are present, and will the project affect any T&E species or their habitat? (Also see 5f)			X		Yes	See 5f
i. Will the project introduce or export any species not presently or historically occurring in the receiving location? (Also see 5d)		X				

Comment 5b: This project is designed to kill unwanted fish. Ostle Reservoir is stocked annually with 2,000 rainbow trout. Previously stocked rainbow trout, a game species, would be removed along with white suckers. Non-targeted fish that would be killed incidentally in the implementation of this project are the fathead minnow and brassy minnow. These impacts would be short term and minor because the reservoir would be restocked with rainbow trout and potentially fathead and brassy minnows.

Fish-consuming birds may be attracted to the dead fish that would result from this project. Although there are no known osprey or bald eagle nesting sites in proximity to the project area, it is possible that migrant ospreys or eagles might consume rotenone-killed fish. Common loons are not known to use Ostle Reservoir, but other fish-eating birds that may be present during the treatment period include common merganser, pied-billed grebe, western grebe, great blue heron, American white pelican, double-crested cormorant, and ring-billed gull. Any of these birds may feed on rotenone-killed fish carcasses shortly after treatment. Active removal of rotenone-killed fish would help minimize risks to fish eating birds, and research has indicated it is not physiologically possible for birds to consume sufficient quantity of rotenone-killed fish to result in a lethal dose. See comment 5c for impacts to birds.

Migratory waterfowl may be present during the proposed treatment period and could be displaced from Ostle Reservoir, but the availability of other waters in close proximity to the project area should minimize any impacts.

Antelope, elk, mountain lion, bobcat, black bear, and mule and white-tailed deer may utilize habitats within the project area on a seasonal or year-round basis. It is possible any of these species may ingest water from the lake during the treatment period. However, there are no effects on mammals from drinking rotenone-treated water. None of these species are dependent upon Ostle Reservoir as a food source. See comment 5c for impacts to mammals.

Comment 5c: Non-game species that might be inadvertently impacted by this project include zooplankton, some aquatic insects, and possibly some amphibians. Zooplankton monitoring would be initiated in Ostle Reservoir prior to the start of the project and follow-up evaluations would be done annually for at least two years following completion of treatment. An amphibian and reptile survey completed in August 2006 near Ostle Reservoir identified the presence of the terrestrial garter snake, common garter snake, and barred tiger salamander (Tabor 2006). A pre-treatment amphibian and reptile survey would be completed at Ostle Reservoir as well as post-treatment surveys in subsequent years.

Numerous studies indicate that rotenone has temporary or minimal affects on aquatic insects and plankton. Anderson (1970) reported that comparisons between samples of zooplankton taken before and after a rotenone treatment did not change a great deal. Despite the inherent natural fluctuations in zooplankton communities, the application of rotenone had little effect on the zooplankton community. Cook and Moore (1969) reported that the application of rotenone has little lasting effect on the non-target insect community of a stream. Kiser et al. (1963) reported that 20 of 22 zooplankton species re-established themselves to pre-treatment levels within about 4 months of a rotenone application. Cushing and Olive (1956) reported that the insects in a lake treated with rotenone exhibited only short-lived effects. Hughey (1975) concluded that three

Missouri ponds treated with rotenone showed little short term and no long term effect on population levels of zooplankton. The effects of rotenone on plankton were consistent with the natural variability that is characteristic of plankton populations, and re-colonization was rapid and reached near pre-treatment levels within eight months.

Both Anderson (1970) and Kiser et al. (1963) reported that most zooplankton species survive a rotenone treatment via their highly resilient egg structures. In addition, parthenogenesis of some female plankton occurs, causing sexual dimorphism, which greatly increases plankton density in times of population distress. Among the aforementioned studies variation in climate, physical environment, and water chemistry would likely cause subtle differences in results in other areas.

Case studies conducted on Devine Lake in the Bob Marshall Wilderness from 1994-1996 indicate that invertebrates actually increased in number and very slightly increased in diversity following a rotenone treatment (Rumsey et al. 1996). This is supported by observations made by Cushing and Olive (1956), who reported that oligochaetes (worms) increased in number after a rotenone treatment then became stable. *Gammarus* species (fresh water shrimp), a common fish food item, were detected in Devine Lake only when fish were present. Neighboring Ross Lake, in the Bob Marshall Wilderness, is fishless and was used to measure natural insect and plankton variation during the Devine Lake treatment and evaluation. *Gammarus* species were never detected in Ross Lake, although it is fishless. Invertebrate numbers in Ross Lake were reported to be relatively stable, but the diversity of insects fluctuated considerably over time. Many studies report that aquatic insects are much less sensitive to rotenone treatment than fish (Schnick 1974). Houf and Campbell (1977) reported no short term or long term effects on species abundance or insect emergence in three ponds treated with 0.5 to 2.0 mg/L of Noxfish 5% rotenone. In a study on the relative tolerance of different aquatic invertebrates to rotenone, Engstrom-Heg et al. (1978) reported that the long-term impacts of rotenone are mitigated because those insects that were most sensitive to rotenone also tended to have the highest rate of recolonization. Aquatic invertebrates in general are capable of rapid recovery from disturbance (Matthaei et al. 1996).

In regard to zooplankton, Schnee (2007b) chronicled two years of post rotenone treatment monitoring for upper and lower Martin lakes near Olney, Montana that were treated in 2005. He concluded that zooplankton density two years after the treatment were similar to pre-treatment densities, and in some cases higher (see tables below). Zooplankton community composition showed no change between 2006 and 2007. Based on this, we would expect the plankton species composition in Ostle Reservoir to return to pre-treatment diversity and abundance within two years.

Upper Martin Lake near Olney, MT:

2005 (pre-treatment)		**2006 (post-treatment)**		**2007 (post-treatment)**	
Date Sampled	Quantity/liter	Date Sampled	Quantity/liter	Date Sampled	Quantity/liter
May	No sample	18-May-06	0.03	10-May-07	16.50
16-Jun-05	24.70	16-Jun-06	0.85	11-Jun-06	19.78
21-Jul-05	5.67	10-Jul-06	19.15	July	No sample
06-Aug-05	8.63	16-Aug-06	9.77	August	No sample
03-Oct-05	4.70	18-Oct-06	4.75	5-Oct-07	10.82

Lower Martin Lake near Olney, MT:

2005 (pre-treatment)		**2006 (post-treatment)**		**2007 (post-treatment)**	
Date Sampled	Quantity/liter	Date Sampled	Quantity/liter	Date Sampled	Quantity/liter
May	No sample	18-May-06	0.40	10-May-07	24.40
16-Jun-05	24.19	16-Jun-06	3.76	11-Jun-06	27.47
21-Jul-05	17.82	10-Jul-06	7.46	July	No sample
06-Aug-05	24.60	16-Aug-06	15.43	August	No sample
03-Oct-05	7.71	18-Oct-06	8.46	5-Oct-07	25.72

Schnee (2007b) concluded that that rotenone's effects on non-target organisms such as plankton amphibians, reptiles and aquatic insects were temporary and natural reproduction and/or recolonization by these species was sufficient to restore populations to pre-treatment densities within two years.

Mammals are generally not affected because they neutralize rotenone by enzymatic action in their stomach and intestines (AFS 2002). Laboratory tests by Marking (1988) fed forms of rotenone to rats and dogs as part of their diet for periods of six months to two years and observed effects such as diarrhea, decreased food consumption, and weight loss. He reported that despite unusually high treatment concentrations of rotenone in rats and dogs, it did not cause tumors or reproductive problems in mammals. Studies of risk for terrestrial animals found that a 22 pound dog would have to drink 7,915 gallons of treated lake water within 24 hours, or eat 660,000 pounds of rotenone-killed fish, to receive a lethal dose (CDFG 1994). The State of Washington reported that a half-pound mammal would need to consume 12.5 mg of pure rotenone to receive a lethal dose (Bradbury 1986). Considering the only conceivable way an animal can consume the compound under field conditions is by drinking lake or stream water, a half pound animal would need to drink 33 gallons of water treated at 2 ppm.

The EPA (2007) made the following conclusion for small mammals and large mammals:

> *When estimating daily food intake, an intermediate-sized 350 g mammal will consume about 18.8 g of food. Using data previously cited from the common carp with a body weight of 88 grams, a small mammal would only consume 21% (18.8/88) of the total carp body mass. According to the data for common carp, total body residues of rotenone in carp amounted to 1.08 µg/g. A 350-g mammal consuming 18.8 grams represents an equivalent dose of 20.3 µg of rotenone; this value is well below the median lethal dose of rotenone (39.5 mg/kg * 0.350 kg = 13.8 mg = 13,800 µg) for similarly sized mammals. When assessing a large mammal, 1000 g is considered to be a default body weight. A 1000 g mammal will consume about 34 g of food. If the animal fed exclusively on carp killed by rotenone, the equivalent dose would be 34 g *1.08 µg/g or 37 µg of rotenone. This value is below the estimated median lethal equivalent concentration adjusted for body weight (30.4 mg/kg * 1 kg = 30.4 mg = 30,400 µg). Although fish are often collected and buried to the extent possible following a rotenone treatment, even if fish were available for consumption by mammals scavenging along the shoreline for dead or dying fish, it is unlikely that piscivorous mammals will consume enough fish to result in observable acute toxicity.*

One study, in which rats were injected with rotenone for a period of weeks, reported finding lesions characteristic of Parkinson's disease (Betarbet et al. 2000). However, the results have been challenged on the basis of methodology: (1) that the continuous intravenous injection method used leads to "continuously high levels of the compound in the blood," and (2) second, that dimethyl sulfoxide (DMSO) was used to enhance tissue penetration (normal routes of exposure actually slow introduction of chemicals into the bloodstream). Finally, injecting rotenone into the body is not a normal way of assimilating the compound. Similar studies (Marking 1988) have found no Parkinson-like results. Extensive research has demonstrated that rotenone does not cause birth defects (HRI 1982), gene mutations (Van Geothem et al. 1981; BRL 1982) or cancer (Marking 1988). Rotenone was found to have no direct role in fetal development of rats that were fed excruciatingly high concentrations of rotenone. Spencer and Sing (1982) reported that rats that were fed diets laced with 10-1000 ppm rotenone over a 10 day period did not suffer any reproductive dysfunction. Typical concentrations of actual rotenone used in fishery management range from 0.025 to 0.50 ppm and are far below that administered during most toxicology studies.

Similar results determined that birds required levels of rotenone at least 1,000 to 10,000-times greater than is required for lethality in fish (Skaar 2001). Cutkomp (1943) reported that chickens, pheasants and members of lower orders of *Galliformes* were quite resistant to rotenone, and four day old chicks were more resistant than adults. Ware (2002) reports that swine are uniquely sensitive to rotenone and it is slightly toxic to wildfowl, but to kill Japanese quail required 4500 to 7000 times more than is used to kill fish.

The EPA (2007) made the following conclusion for birds;

> *Since rotenone is applied directly to water, there is little likelihood that terrestrial forage items for birds will contain rotenone residues from this use. While it is possible that some piscivorous birds may feed opportunistically on dead or dying fish located on the surface of treated waters, protocols for piscicidal use typically recommend that dead fish be collected and buried, rendering the fish less available for consumption (see Section IV). In addition, many of the dead fish will sink and not be available for consumption by birds. However, whole body residues in fish killed with rotenone ranged from 0.22 µg/g in yellow perch (Perca flavescens) to 1.08 µg/g in common carp (Cyprinus carpio) (Jarvinen and Ankley 1998). For a 68 g yellow perch and an 88 g carp, this represents totals of 15 µg and 95 µg rotenone per fish, respectively. Based on the avian subacute dietary LC_{50} of 4110 mg/kg, a 1000-g bird would have to consume 274,000 perch or 43,000 small carp. Thus, it is unlikely that piscivorous birds will consume enough fish to result in a lethal dose.*

Chandler and Marking (1982) found that clams and snails were between 50 and 150 times more tolerant than fish to Noxfish (5% rotenone formulation), and Southern Leopard frog tadpoles were between 3 and 10 times more tolerant than fish. Grisak et al. (2007) conducted laboratory studies on longtoed salamanders, Rocky Mountain tailed frogs, and Columbia spotted frogs and concluded that the adults of these species would not suffer an acute response to Prenfish at trout killing concentrations (0.5-1 mg/L) but the larvae would likely be affected. These authors

recommended implementing rotenone treatments at times when the larvae are not present, such as the fall, to reduce the chance of exposure to rotenone treated water and potential impacts to larval amphibians.

It is important to note that many toxicity studies involve subjecting laboratory specimens to unusually high concentrations of rotenone, or conducting tests on animals that would not normally be exposed to rotenone during use in fisheries management.

Based on this information we would expect the impacts to non-target organisms to range from non-existent to short term and minor.

Comment 5f: The Blackleaf WMA supports one of the highest densities of grizzly bears on the Rocky Mountain Front (M. Madel, MFWP, personal communication). Thus, grizzly bears are common in this area but are not dependant on Ostle Reservoir or fish in the reservoir for food. Dead fish resulting from this project may attract grizzly bears, but frequent removal of these fish by project personnel should minimize the development of an unnatural food attractant that may concentrate bears at the reservoir. Consumption of dead fish resulting from the treatment would not have negative impacts on grizzly bears (see 5c for impacts to mammals). Potential bear-human conflicts that might arise from this project would be minimized with implementation of an area closure excluding public access for at least seven days following treatment. MFWP personnel would remain onsite to enforce the area closure and remove dead fish on a daily basis.

B.HUMAN ENVIRONMENT

6. NOISE/ELECTRICAL EFFECTS **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Increases in existing noise levels?			X			6a
b. Exposure of people to serve or nuisance noise levels?		X				
c. Creation of electrostatic or electromagnetic effects that could be detrimental to human health or property?		X				
d. Interference with radio or television reception and operation?		X				

Comment 6a: The only noise generated from this project would be from an outboard motor, but is consistent with present levels. The noise generated from this would be short term and minor.

7. LAND USE Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Alteration of or interference with the productivity or profitability of the existing land use of an area?		X				
b. Conflicted with a designated natural area or area of unusual scientific or educational importance?		X				
c. Conflict with any existing land use whose presence would constrain or potentially prohibit the proposed action?			X			7c
d. Adverse effects on or relocation of residences?		X				

Comment 7c: An area closure would be implemented at the time of project implementation to exclude public access for a minimum of seven days following treatment. This would include closing the access road and signing the perimeter of the reservoir. Once the reservoir is determined to be detoxified this closure would be lifted. The project would be scheduled so that the closure does not conflict with big game archery or upland bird hunting seasons.

Cattle grazing is permitted on the Blackleaf WMA within established pastures based on a rest-rotation grazing plan. Although there is no risk to livestock from ingesting treated water (see 5c), prior to project implementation MFWP would work with the permittee to ensure all cattle are removed from pastures within the project area during the treatment period.

8. RISK/HEALTH HAZARDS Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Risk of an explosion or release of hazardous substances (including, but not limited to oil, pesticides, chemicals, or radiation) in the event of an accident or other forms of disruption?			X		Yes	8a
b. Affect an existing emergency response or emergency evacuation plan or create a need for a new plan?			X		Yes	8b
c. Creation of any human health hazard or potential hazard?			X		Yes	see 8a,8c
d. Will any chemical toxicants be used?			X		Yes	see 8a

Comment 8a: The principal risk of human exposure to hazardous materials from this project would be limited to the applicators. All applicators would wear safety equipment required by the

product labels and MSDS sheets such as respirator, goggles, rubber boots, Tyvek overalls, and Nitrile gloves. All applicators would be trained on the safe handling and application of the piscicide. Two Montana Department of Agriculture certified pesticide applicators would supervise and administer the project. Materials would be transported, handled, applied and stored according to the label specifications to reduce the probability of human exposure or spill.

Comment 8b: MFWP requires a treatment plan for rotenone projects. This plan addresses many aspects of safety for people who are on the implementation team such as establishing a clear chain of command, training, delegation and assignment of responsibility, clear lines of communication between members, spill contingency plan, first aid, emergency responder information, personal protective equipment, monitoring and quality control, among others. Implementing this project should not have any impact on existing emergency plans. Because an implementation plan has been developed by MFWP the risk of emergency response is minimal and any affects to existing emergency responders would be short term and minor.

Comment 8c: The EPA (2007) conducted an analysis of the human health risks for rotenone and concluded it has a high acute toxicity for both oral and inhalation routes, but has a low acute toxicity for dermal route of exposure. It is not an eye or skin irritant nor a skin sensitizer. The EPA could not provide a quantitative assessment of potentially critical effect on neurotoxicity risks to rotenone users, so a number of uncertainty factors were assigned to the rating values. They are: an additional 10x database uncertainty factor - in addition to the inter-species (10x) uncertainty factor and intra-species (10x) uncertainty factor – has been applied to protect against potential human health effects and the target margin of exposure (MOE) is 1000. The following table summarizes the EPA toxicological endpoints of rotenone (from EPA 2007).

Exposure Scenario	Dose Used in Risk Assessment, Uncertainty Factor (UF)	Level of Concern for Risk Assessment	Study and Toxicological Effects
Acute Dietary (females 13-49)	NOAEL = 15 mg/kg/day UF = 1000 aRfD = 15 mg/kg/day = 0.015 mg/kg/day 1000	Acute PAD = 0.015 mg/kg/day	Developmental toxicity study in mouse (MRID 00141707, 00145049) LOAEL = 24 mg/kg/day based on increased resorptions
Acute Dietary (all populations)	An appropriate endpoint attributable to a single dose was not identified in the available studies, including the developmental toxicity studies.		
Chronic Dietary (all populations)	NOAEL = 0.375 mg/kg/day UF = 1000 cRfD = 0.375 mg/kg/day = 0.0004 mg/kg/day 1000	Chronic PAD = 0.0004 mg/kg/day	Chronic/oncogenicity study in rat (MRID 00156739, 41657101) LOAEL = 1.9 mg/kg/day based on decreased body weight and food consumption in both males and females
Incidental Oral Short-term (1-30 days) Intermediate-term (1-6 months)	NOAEL = 0.5 mg/kg/day	Residential MOE = 1000	Reproductive toxicity study in rat (MRID 00141408) LOAEL = 2.4/3.0 mg/kg/day [M/F] based on decreased parental (male and female) body weight and body weight gain
Dermal Short-, Intermediate-, and Long-Term	NOAEL = 0.5 mg/kg/day 10% dermal absorption factor	Residential MOE = 1000 Worker MOE = 1000	Reproductive toxicity study in rat (MRID 00141408) LOAEL = 2.4/3.0 mg/kg/day
Inhalation Short-term (1-30 days) Intermediate-term (1-6 months)	NOAEL = 0.5 mg/kg/day 100% inhalation absorption factor	Residential MOE = 1000 Worker MOE = 1000	[M/F] based on decreased parental (male and female) body weight and body weight gain
Cancer (oral, dermal, inhalation)	Classification; No evidence of carcinogenicity		

UF = uncertainty factor, NOAEL = no observed adverse effect level, LOAEL = lowest observed adverse effect level, aPAD = acute population adjusted dose, cPAD = chronic population adjusted does, RfD = reference dose, MOE = margin of exposure, NA = Not Applicable

Rotenolenoids are common degredation products found in the parent plant material used to make piscicidal forms of rotenone. The EPA (2007) concluded these degredation products are no more toxic than the active ingredient.

The EPA analysis of acute dietary risk for both food and drinking water concluded:

> *"…When rotenone is used in fish management applications, food exposure may occur when individuals catch and eat fish that either survived the treatment or were added to the water body (restocked) prior to complete degradation. Although exposure from this route is unlikely for the general U.S. population, some people might consume fish following a rotenone application. EPA used maximum residue values from a bioaccumulation study to estimate acute risk from consuming fish from treated water bodies. This estimate is considered conservative because the bioaccumulation study measured total residues in edible portions of fish including certain non-edible portions (skin, scales, and fins) where concentrations may be higher than edible portions (tissue) and the Agency assumed that 100% of fish consumption could come from rotenone exposed fish. In addition, fish are able to detect rotenone's presence in water and, when possible, attempt to avoid the chemical by moving from the treatment area. Thus, for partial kill uses, surviving fish are likely those that have intentionally minimized exposure.*
>
> *Acute exposure estimates for drinking water considered surface water only because rotenone is only applied directly to surface water and is not expected to reach groundwater. The estimated drinking water concentration (EDWC) used in dietary exposure estimates was 200 ppb, the solubility limit of rotenone. The drinking water risk assessment is conservative because it assumes water is consumed immediately after treatment with no degradation and no water treatment prior to consumption.*
>
> *Acute dietary exposure estimates result in dietary risk below the Agency's level of concern. Generally, EPA is concerned when risk estimates exceed 100% of the acute population adjusted dose (aPAD). The exposure for the "females 13-49 years old" subgroup (0.1117 mg/kg/day) utilized 74% of the aPAD (0.015 mg/kg/day) at the 95th percentile (see Table 5). It is appropriate to consider the 95th percentile because the analysis is deterministic and unrefined. Measures implemented as a result of this RED will further minimize potential dietary exposure (see Section IV)…"*

As for evaluating the human chronic risk from exposure to rotenone treated water, the EPA acknowledges the four principle reasons for concluding there is a low risk: 1. The rapid natural degradation of rotenone; 2. Using active detoxification measures by applicators such as potassium permanganate; 3. Properly following piscicide labels which prohibit the use near water intakes; 4. Proper signing, public notification or area closures which limit public exposure to rotenone treated water.

As for recreational exposure, the EPA concludes no risk to adults who enter treated water following the application from either dermal or incidental ingestion, but requires a waiting period of three days after a treatment before toddlers swim in treated water. The aggregate risk to human health from food, water and swimming does not exceed the EPA level of concern (EPA 2007).

Recreationists in the area would likely not be exposed to the treatments because a temporary area closure would exclude public access. Proper warning through news releases, signing the project area, road closure and presence of agency personnel in the project area should be adequate to

keep the public from being exposed to any treated waters. Project personnel would diligently collect dead fish and either sink in the reservoir or remove from the site.

Aside from the rotenone itself, liquid formulations [Prenfish] also consist of petroleum emulsifiers. Finlayson et al. (2000) wrote regarding the health risks of these constituent elements:

> " . . . the EPA has concluded that the use of rotenone for fish control does not present a risk of unreasonable adverse effects to humans and the environment. The California Environmental Protection Agency found that adverse impacts from properly conducted, legal uses of liquid rotenone formulations in prescribed fish management projects were nonexistent or within acceptable levels (memorandum from J. Wells, California Department of Pesticide Regulation, to Finlayson, 3 August 1993). Liquid rotenone contains the carcinogen trichloroethylene (TCE). However, the TCE concentration in water immediately following treatment (less than 0.005 mg TCE per liter of water [5 ppb]) is within the level permissible in drinking water (0.005 mg TCE per liter of water, EPA 1980b). None of the other materials including xylenes, naphthalene, piperonyl butoxide, and methylnaphthalenes exceed any water quality criteria guidelines (based on lifetime exposure) set by the EPA (1980a, 1981a, 1993). Many of these materials in the liquid rotenone formulations (trichloroethylene, naphthalene, and xylene) are the same as those found in fuel oil and are present in waters everywhere because of the frequent use of outboard motors . . ."

California Department of Fish and Game (CDFG, 1994) calculated that the maximum expected level of these contaminants following a treatment level of 2 ppm formulation are TCE 1.1 ppb; toluene 84 ppb; xylenes 3.4 ppb; naphthalene 140 ppb.

The product label states:

> " . . . do not use dead fish for food or feed, do not use water treated with rotenone to irrigate crops or release within ½ mile upstream of a potable water or irrigation water intake in a standing body of water such as a lake, pond, or reservoir. . . . do not allow swimming in rotenone treated water until the application has been completed and all pesticide has been thoroughly mixed into the water according to the labeling instructions. This product is flammable and should be kept away from heat and open flame . . ."

The occupational risks to humans is low if proper safety equipment and handling procedures are followed as directed by the product labels (EPA 2007). The major risks to human health from rotenone come from accidental exposure during handling and application. This is the only time when humans are exposed to concentrations that are greater than that needed to remove fish. To prevent accidental exposure to liquid formulated or powdered rotenone, the Montana Department of Agriculture requires applicators to be:

- Trained and certified to apply the pesticide in use
- Equipped with the proper safety gear, which, in this case, includes respirator, eye protection, rubberized gloves, hazardous material suit
- Have product labels with them during use

- Contain materials only in approved containers that are properly labeled
- Adhere to the product label requirements for storage, handling, and application

Any threats to human health during application would be greatly reduced with proper use of safety equipment.

There is an inhalation risk to ground applicators. To guard against this, ground applicators would be equipped with protective clothing, eye, and label approved respirators or masks.

In their description of how South American Indians prepare and apply *Timbó*, a rotenone parent plant, Teixeira, et al. (1984) reported that the Indians extensively handled the plants during a mastication process, and then swam in lagoons to distribute the plant pulp. No harmful effects were reported. It is important to note that the primitive method of applying rotenone from root did not involve a calculated target concentration, metering devices or recognition of human health risk precautions similar to those involved with fisheries management programs.

A recent study linked the use of rotenone and paraquat with the development of Parkinson's disease (PD) in humans later in life (Tanner et al. 2011). The after the fact study included mostly farmers from 2 states within the United States who presumably used rotenone for terrestrial application to crops and/or livestock. Rotenone is no longer approved for agricultural uses and is only approved for aquatic application as a piscicide. The results of epidemiological studies of pesticide exposure, such as this one have been highly variable (Guenther et al. 2011). Studies have found no correlations between pesticide exposure and PD (e.g., Jiménez-Jiménez 1992; Hertzman 1994; Engel et al. 2001; Firestone et al. 2010), some have found correlations between pesticide exposure and PD (e.g., Hubble et al. 1993; Lai et al. 2002; Tanner et al. 2011) and some have found it difficult determine which pesticide or pesticide class is implicated if associations with PD occur (e.g., Engel et al. 2001; Tanner et al. 2009). Recently, epidemiological studies linking pesticide exposure to PD have been criticized due to the high variation among study results, generic categorization of pesticide exposure scenarios, questionnaire subjectivity, and the difficulty in evaluating the causal factors in the complex disease of PD, which may have multiple causal factors (age, genetics, environment) (Raffaele et al. 2011). A specific concern is the inability to assess the degree of exposure to certain chemicals, including rotenone, particularly the concentration of the chemical, frequency of use, application (e.g., agricultural, insect removal from pets), and exposure routes (Raffaele et al. 2011). No information is given in the Tanner et al. (2011) study about the formulation of rotenone used (powder or liquid) or the frequency or dose farmers were exposed to during their careers. There is also no information given about the personal protective equipment used or any information about other pesticides farmers were exposed to during the period of the study. It is also unclear in the Tanner et al. (2011) study the frequency and the dose individuals were exposed to during the time period of use. Without information on how much rotenone individuals were exposed to and for how long, it is difficult to evaluate the potential risk to humans of developing Parkinson's disease from aquatic applications of rotenone products.

The state of Arizona conducted an exhaustive review to the risks to human health of rotenone use as a piscicide (Guenther et al. 2011). They concluded: "To date, there are no published studies

that conclusively link exposure to rotenone and the development of clinically diagnosed PD. Some correlation studies have found a higher incidence of PD with exposure to pesticides among other factors, and some have not. It is very important to note that in case-control correlation studies, causal relationships cannot be assumed and some associations identified in odds-ratio analyses may be chance associations. Only one study (Tanner et al. 2011) found an association between rotenone and paraquat use and PD in agricultural workers, primarily farmers. However, there are substantial differences between the methods of application, formulation, and doses of rotenone used in agriculture and residential settings compared with aquatic use as a piscicide, and the agricultural workers interviewed were also exposed to many other pesticides during their careers. Through the EPA re-registration process of rotenone, occupational exposure risk is minimized by: new requirements that state handlers may only apply rotenone at less than the maximum treatment concentrations (200 ppb), the development of engineering controls to some of the rotenone dispensing equipment, and requiring handlers to wear specific PPE."

It is clear that to reduce or eliminate the risk to human health, including any potential risk of developing Parkinson's disease, public exposure to rotenone treated water must be eliminated to the extent possible. To reduce the potential for exposure of the public during the proposed use of CFT Legumine to restore WCT, areas treated with rotenone would be closed to public access during the treatment. Signs would be placed at access points informing the public of the closure and the presence rotenone treated waters. Personnel would be onsite to inform the public and escort them from the treatment area should they enter. Rotenone treated waters would be contained to the proposed treatment areas by over 1 mile of dry channel and if necessary, adding potassium permanganate to the stream at the downstream end of the treatment reach, either at the fish barrier or downstream where the stream re-surfaces. Potassium permanganate would neutralize any remaining rotenone before leaving the project area. The efficacy of the neutralization would be monitored using fish (the most sensitive species to the chemical) and a hand held chlorine meter. Therefore, the potential for public exposure to rotenone treated waters is very minimal. The potential for exposure would be greatest for those government workers applying the chemical. To reduce their exposure, all CFT Legumine label mandates for personal protective equipment would be adhered to (see Comment 8a).

9. COMMUNITY IMPACT **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Alteration of the location, distribution, density, or growth rate of the human population of an area?		X				
b. Alteration of the social structure of a community?		X				
c. Alteration of the level or distribution of employment or community or personal income?		X				
d. Changes in industrial or commercial activity?		X				

e. Increased traffic hazards or effects on existing transportation facilities or patterns of movement of people and goods?		X				

10. PUBLIC SERVICES/TAXES/UTILITIES **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Will the proposed action have an effect upon or result in a need for new or altered governmental services in any of the following areas: fire or police protection, schools, parks/recreational facilities, roads or other public maintenance, water supply, sewer or septic systems, solid waste disposal, health, or other governmental services? If any, specify: _____		X				10a
b. Will the proposed action have an effect upon the local or state tax base and revenues?		X				
c. Will the proposed action result in a need for new facilities or substantial alterations of any of the following utilities: electric power, natural gas, other fuel supply or distribution systems, or communications?		X				
d. Will the proposed action result in increased used of any energy source?		X				
e. Define projected revenue sources		X				
f. Define projected maintenance costs		X				

Comment 10a: These types of piscicide treatments are within normal duties of MFWP fisheries personnel and will not result in any additional demands upon the agency.

11. AESTHETICS/RECREATION Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Alteration of any scenic vista or creation of an aesthetically offensive site or effect that is open to public view?		X				
b. Alteration of the aesthetic character of a community or neighborhood?		X				
c. Alteration of the quality or quantity of recreational/tourism opportunities and settings? (Attach Tourism Report)			X		Yes	See 11c
d. Will any designated or proposed wild or scenic rivers, trails or wilderness areas be impacted? (Also see 11a, 11c)		X				

Comment 11c: There would be a temporary loss of angling opportunity at Ostle Reservoir between the time of fish removal and subsequent restocking. Restocking may occur in fall 2013 if catchable-size rainbow trout are available from the state hatchery system. However, the objective of the project is to improve angling quality at Ostle Reservoir, which likely would result in increased use by recreationists. The benefits of increased recreational use would outweigh any impacts associated with the actual treatment. Any impacts to aesthetics would be short term and minor and be directly associated with the actual treatment and immediate aftermath, including dead fish in the project area. A tourism report is not necessary to quantify these impacts.

12. CULTURAL/HISTORICAL RESOURCES Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Destruction or alteration of any site, structure or object of prehistoric historic, or paleontological importance?		X				
b. Physical change that would affect unique cultural values?		X				
c. Effects on existing religious or sacred uses of a site or area?		X				12c
d. Will the project affect historic or cultural resources?		X				

Comment 12c. The project site is located within the aboriginal range of the Blackfeet and Gros Ventre tribes. Notification of this proposed action and EA will be forwarded to tribal representatives to help determine if this project would impact their historical, cultural or religious values. To date there have been no cultural or religious sites identified within the project site, and there would not be any ground breaking activities associated with this project.

13. SUMMARY EVALUATION OF SIGNIFICANCE Will the proposed action, considered as a whole:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Have impacts that are individually limited, but cumulatively considerable? (A project or program may result in impacts on two or more separate resources which create a significant effect when considered together or in total.)		X				
b. Involve potential risks or adverse effects which are uncertain but extremely hazardous if they were to occur?		X				
c. Potentially conflict with the substantive requirements of any local, state, or federal law, regulation, standard or formal plan?		X				
d. Establish a precedent or likelihood that future actions with significant environmental impacts will be proposed?		X				
e. Generate substantial debate or controversy about the nature of the impacts that would be created?	X	X			Yes	13e
f. Is the project expected to have organized opposition or generate substantial public controversy? (Also see 13e)	X	X				13f
g. List any federal or state permits required.						13g

Comments 13e and f: The use of pesticides can generate controversy from some people. Public outreach and informational programs can educate the public on the use of pesticides. It is not expected that this project would have organized opposition.

Comment 13g: MFWP would apply rotenone under the Montana Dept. of Environmental Quality (DEQ) General Permit for Pesticide Application (#MTG87000). A Notice of Intent was accepted by the Department of Environmental Quality. The NOI included the waters proposed in this EA. A letter was received from DEQ dated August 13, 2012 recognizing the Notice of Intent and allowing MFWP to operate under the General permit for Pesticide Application. The project is located entirely on land owned and managed by MFWP. No special use permit is required by the agency.

PART III. ALTERNATIVES

Alternative 1 – No Action

The no action alternative would allow current management to continue which would maintain the present angling quality and species diversity in Ostle Reservoir. Ostle Reservoir would continue to be stocked with rainbow trout. Trout growth rates would continue to be below the potential of Ostle Reservoir. White sucker populations may continue to increase under status quo management

Alternative 2 - Proposed Action

The proposed action involves removing white suckers from Ostle Reservoir and its tributary stream/ditch using Prenfish and Prentox rotenone. Following successful completion of the treatment, the reservoir would be re-stocked with rainbow trout. Based on the productivity of this reservoir and MFWP file reports, this species is expected to thrive in this type of reservoir environment in the absence of white suckers. MFWP has numerous examples of successful projects with similar objectives.

This alternative offers the highest probability of achieving the goals of improving and maintaining the rainbow trout fishery in Ostle Reservoir.

Alternative 3 – Mechanical removal and restocking with rainbow trout

This alternative would involve using gill nets and/or trap nets to remove the unwanted species of fish, then stocking trout to improve angling quality.

Gill netting has been used successfully to remove unwanted fish from lakes. Bighorn Lake, a 5.2 acre lake located in Banff National Park in Alberta, Canada, was gillnetted from 1997 to 2000 to remove an unwanted population of brook trout (Parker et al. 2001). Over 10,000 net nights (1 net night = 1 net set overnight for at least 12 hours) were conducted over a four-year period in Bighorn Lake to remove the population which totaled 261 fish. The researchers concluded that the removal of nonnative trout using gill nets was impractical for larger lakes (> 5 acres). In clear lakes, trout have the ability to become acclimated to the presence of gill nets and to avoid them. These researchers reported observing brook trout avoiding gill nets within about 2 hours of being set. It is not known if white suckers would develop similar net avoidance behavior.

Deploying gill nets and traps requires frequent presence at the site to check and reset nets. There would be an unsustainable time commitment required to attempt this method of fish removal. Due to these considerations and expected incomplete results, this alternative has a low probability of meeting the project objectives.

PART IV. ENVIRONMENTAL ASSESSMENT CONCLUSION SECTION

A) Is an EIS required? No

This environmental review demonstrates that the impacts of this proposed project are not significant. The proposed action would benefit the fishery of Ostle Reservoir with minimal impact on the physical, biological, or the human environment, and thus would not require the detailed environmental review of an Environmental Impact Statement.

B) Public Involvement.

The public will be notified through contact with local landowners, sporting and recreational groups, and others who have previously indicated interest in similar projects. This EA will be posted on the MFWP web page (http://fwp.mt.gov/news/publicNotices/), and notification of the proposed project will be mailed or emailed directly to interested persons. Any interested citizen will be encouraged to contact the preparer of this EA to discuss the proposal. The public comment period will be open for at least 30 days. This level of public involvement is believed adequate for the proposed project as recent and similar type piscicide efforts in the FWP Region 4 have produced no significant issues or controversy.

C) Addresses to submit written comments:

Public comments can be given at the FWP web page (http://fwp.mt.gov/news/publicNotices/), or in writing to:

Submit written comments to: Dave Yerk
MTFWP
PO Box 746
Choteau, MT 59422

Or email to: dyerk@mt.gov

Comments on the EA will be accepted until **5:00 PM July 25, 2013.** Please include your name and address with any comment.

D) Name, title, address, and telephone number of the Person Responsible for Preparing the EA Document:

Dave Yerk
Fisheries Biologist
Montana Fish, Wildlife and Parks
PO Box 746
Choteau, MT 59422
(406) 466-5621
dyerk@mt.gov

Paul Hamlin
Fisheries Technician
Montana Fish, Wildlife & Parks
4600 Giant Springs Rd.
Great Falls, MT 59405
(406) 454-5852
phamlin@mt.gov

References

AFS (American Fisheries Society). 2002. Rotenone stewardship program, fish management chemicals subcommittee. www.fisheries.org/rotenone/.

Anderson, R.S. 1970. Effects of rotenone on zooplankton communities and a study of their recovery patterns in two mountain lakes in Alberta. Journal of the Fisheries Research Board of Canada. Vol 27, no. 8, 1335-1355

Betarbet, R., T.B. Sherer, G. MacKenzie, M. Garcia-Osuna, A.V. Panov, and T. Greenamyre. 2000. Chronic systemic pesticide exposure reproduces features of Parkinson's disease. *Nature Neuroscience* 3 (12): 1301-1306.

Bradbury, A. 1986. Rotenone and trout stocking: a literature review with special reference to Washington Department of Game's lake rehabilitation program. Fisheries management report 86-2. Washington Department of Game.

BRL (Biotech Research Laboratories). 1982. Analytical studies for detection of chromosomal aberrations in fruit flies, rats, mice, and horse bean. Report to U.S. Fish and Wildlife Service (USFWS Study 14-16-0009-80-54). National fishery research Laboratory, La Crosse, Wisconsin.

CDFG (California Department of Fish and Game), 1994. Rotenone use for fisheries management, July 1994, final programmatic environmental impact report. State of California Department of Fish and Game.

Chandler, J.H. and L.L. Marking. 1982. Toxicity of rotenone to selected aquatic invertebrates and frog larvae. The progressive fish culturist 44(2) 78-80.

Cook, S.F. and R.L. Moore. 1969. The effects of a rotenone treatment on the insect fauna of a California stream. Transactions of the American Fisheries Society 83 (3):539-544.

Cushing, C.E. and J.R. Olive. 1956. Effects of toxaphene and rotenone upon the macroscopic bottom fauna of two northern Colorado reservoirs. Transactions of the American Fisheries Society 86:294-301.

Cutkomp, L.K. 1943. Toxicity of rotenone to animals: a review and comparison of responses shown by various species of insects, fishes, birds, mammals, etc. Soap and Sanitary Chemicals 19(10): 107-123.

Dawson, V.K., W.H. Gingerich, R.A. Davis, and P.A. Gilderhus. 1991. Rotenone persistence in freshwater ponds: effects of temperature and sedimant adsorption. North American Journal of Fisheries Management 11:226-231.

Engel, L.S., H. Checkoway, M. C. Keifer, N. S. Seixas, W. T. Longstreth Jr., K. C. Scott, K. Hudnell, W. K. Anger, and R. Camicioli. 2001. Parkinsonism and occupational exposure to pesticides. Occupational Environmental Medicine 58:582-589.

Engstrom-Heg, R, R.T. Colesante, and E. Silco.1978. Rotenone Tolerances of Stream-Bottom Insects. New York Fish and Game Journal 25 (1):31-41.

Engstrom-Heg, R. 1971. Direct measure of potassium permanganate demand and residual potassium permanganate. New York Fish and Game Journal vol. 18 no. 2:117-122.

Engstrom-Heg, R. 1972. Kinetics of rotenone-potassium permanganate reactions as applied to the protection of trout streams. New York Fish and Game Journal vol. 19 no. 1:47-58.

Engstrom-Heg, R. 1976. Potassium permanganate demand of a stream bottom. New York Fish and Game Journal vol. 23 no. 2:155-159.

EPA, 2007. United States Environmental Protection Agency, prevention, pesticides and toxic substances (7508P). EPA 738-R-07-005. Reregistration Eligibility Decision for Rotenone, List **A** Case No. 0255.

Finlayson, B.J., R.A. Schnick, R.L. Caiteux, L. DeMong, W.D. Horton, W. McClay, C.W. Thompson, and G.J. Tichacek. 2000. Rotenone Use in Fisheries Management: Administrative and Technical Guidelines Manual. American Fisheries Society, Bethesda, Maryland.

Firestone, J.A., J.I. Lundin, K.M. Powers, T. Smith-Weller, G.M. Franklin, P.D. Swanson, W.T. Longstreth Jr., and H. Checkoway. 2010. Occupational factors and risk of Parkinson's disease: a population-based case-control study. American Journal of Industrial Medicine 53:217-223.

Gilderhus, P.A., J.L. Allen, and V.K. Dawson. 1986. Persistence of rotenone in ponds at different temperatures. North American Journal of Fisheries Management. 6: 129-130.

Grisak, G.G., D. R. Skaar, G. L. Michael, M.E. Schnee and B.L. Marotz. 2007. Toxicity of Fintrol (antimycin) and Prenfish (rotenone) to three amphibian species. Intermountain Journal of Sciences. Vol. 13, No.1:1-8.

Guenther, H., M. Schaefer and 19 others. 2011. Rotenone Review Advisory Committee Final Report and Recommendations to the Arizona Game and Fish Department. http://www.azgfd.gov/h_f/documents/Rotenone_Review_Advisory_Committee_Final_Report_12_31_2011.pdf.

Hertzman, C., M. Wiens, and B. Snow. 1994. A case-control study of Parkinson's disease in a horticultural region of British Columbia. Movement Disorders 9(1):69-75.

Hisata, J.S. 2002. Lake and stream rehabilitation: rotenone use and health risks. Final supplemental environmental impact statement. Washington Department of Fish and Wildlife, Olympia.

Houf, L.J. and R.S. Campbell. 1977. Effects of antimycin a and rotenone on macrobenthos in ponds. Investigations in fish control number 80. U.S. Fish and Wildlife Service. Fish Control Laboratory, LaCrosse.

HRI (Hazelton Raltech Laboratories). 1982. Teratology studies with rotenone in rats. Report to U.S. Geological Survey. Upper Midwest Environmental Sciences Center (USFWS Study 81-178). La Crosse, Wisconsin.

Hubble, J.P., T. Cao, R.E.S. Hassanein, J.S. Neuberger, and W.C. Koller. 1993. Risk factors for Parkinson's disease. Neurology 43:1693-1697.

Hughey, R.E. 1975. The effects of fish toxicant antimycin A and rotenone on zooplankton communities in ponds. Masters thesis. University of Missouri. Columbia.

Jiménez-Jiménez, F., D. Mateo, and S. Giménex-Roldán. 1992. Exposure to well water and pesticides in Parkinson's disease: a case-control study in the Madrid area. Movement Disorders 7(2):149-152.

Kiser, R.W., J.R. Donaldson, and P.R. Olson. 1963. The effect of rotenone on zooplankton populations in freshwater lakes. Transactions of the American Fisheries Society 92(1):17-24.

Lai, B.C.L., S.A. Marion, K. Teschke, and J.K.C. Tsui. 2002. Occupational and environmental risk factors for Parkinson's disease. Parkinsonism and Related Disorders 8:297-309.

Ling, N. 2002: Rotenone, a review of its toxicity and use for fisheries management. New Zealand Department of Conservation *Science for Conservation 211*. 40 p.

Loeb, H.A. and R. Engstrom-Heg. 1970. Time-dependant changes in toxicity of rotenone dispersions to trout. Toxicology and applied pharmacology 17, 605-614.
Marking, L.L. 1988. Oral toxicity of rotenone to mammals. Investigations in fish control, technical report 94. U.S, Fish and Wildlife Service, National Fisheries Research Center, La Crosse, Wisconsin.
Matthaei, C.D., Uehlinger, U., Meyer, E.I., Frutiger, A. 1996. Recolonization by benthic invertebrates after experimental disturbance in a Swiss prealpine river Freshwater Biology 35 (2):233-248.
Meronek, T.G., P.M. Bouchard, E.R. Buckner, T.M. Burri, K.K. Demmerly, D.C.Hatleli, R.A.Klumb, SH. Schmidt and D.W.Coble. 1996. A review of fish control projects. North American Journal of Fisheries Management 16:63-74.
ODFW, 2002. Questions and answers about rotenone. *from* Oregon Department of Fish and Wildlife web page, Diamond Lake rotenone treatment, www.dfw.state.or/ODFWhtml/InfoCntrFish/DiamondLake.Rotenone.html.
Parker, B.R., D.W. Schindler, D.B. Donald, and R.S. Anderson. 2001. The effects of stocking and removal of a nonnative salmonid on the plankton of an alpine lake. Ecosystems (2001) 4:334-345.
Parker, R.O. 1970. Surfacing of dead fish following application of rotenone. Transactions of the American Fisheries Society. 99 4:805-807.
Prentiss Incorporated. 1998. Product label for Prentox-Prenfish toxicant, 5% liquid formulation of rotenone. Sandersville, Georgia.
Prentiss Incorporated. 2007. Product label for CFT Legumine™ fish toxicant, 5% liquid formulation of rotenone. Sandersville, Georgia.
program. Specialist report for environmental impact statement. MFWP, Kalispell.
Raffaele, K.C., S.V. Vulimiri, and T.F. Bateson. 2011. Benefits and barriers to using epidemiology data in environmental risk assessment. The Open Epidemiology Journal 4:99-105.
Rumsey, S., J. Fraley, and J. Cavigli. 1996. Ross and Devine lakes invertebrate results – 1994-1996. File report. Montana Fish, Wildlife & Parks, Kalispell.
Schnee, M.E. 2006. Martin Lakes 1-year, post rotenone treatment report. Montana Fish, Wildlife & Parks, Kalispell.
Schnee, M.E. 2007a. Blue Lake 1-year, post rotenone treatment report. Montana Fish, Wildlife & Parks, Kalispell.
Schnee, M.E. 2007b. Martin Lakes 2-year, post rotenone treatment report. Montana Fish, Wildlife & Parks, Kalispell.
Schnick, R. A. 1974. A review of the literature on the use of rotenone in fisheries. USDI Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife, LaCrosse, WI.
Skaar, D. 2001. A brief summary of the persistence and toxic effects of rotenone. Montana Fish, Wildlife & Parks, Helena.
Spencer, F. and L.T. Sing. 1982. Reproductive responses to rotenone during decidualized pseudogestation and gestation in rats. *Bulletin of Environmental Contamination and Toxicology*. 228: 360-368.
Tabor, T. 2006. Prairie streams survey 2006 – Region 4. Montana Fish, Wildlife & Parks, Great Falls.

Tanner, C.M., F. Kamel, W. Ross, J.A. Hoppin, S.M. Goldman, M. Korell, C. Marras, G.S. Bhudhikanok, M. Kasten, A.R. Chade, K. Comyns, M.B. Richards, C. Meng, B. Priestley, H.H. Fernandex, F. Cambi, D.M. Umbach, A. Blair, D.P. Sandler, and J.W. Langston. 2011. Rotenone, paraquat, and Parkinson's disease. Environmental Health Perspectives 119(6):866-872.

Tanner, C.M., G.W. Ross, S.A. Jewell, R.A. Hauser, J. Jankovic, S.A. Factor, S. Bressman, A. Deligtisch, C. Marras, K.E. Lyons, G.S. Bhudhikanok, D.F. Roucoux, C. Meng, R.D. Abbott, and J.W. Langston. 2009. Occupation and risk of Parkinsonism. Arch Neurology 66(9):1106-1113.

Teixeira, J.R.M., A.J. Lapa, C. Souccar, and J.R. Valle. 1984. Timbós: ichthyotoxic plants used by Brazilian Indians. Journal of Ethnopharmacology, 10:311-318.

Van Goethem, D, B. Barnhart, and S. Fotopoulos. 1981. Mutagenicity studies on rotenone. Report to U.S. Geological Survey. Upper Midwest Environmental Sciences Center (USFWS Study 14-16-009-80-076), La Crosse, Wisconsin.

Ware, G.W. 2002. An introduction to insecticides 3rd edition. University of Arizona, Department of Entomology, Tuscon. *on* EXTOXNET. Extension Toxicology Network. Oregon State University web page.